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10/781,999	02/19/2004	Shuichi Ohkubo	17449	5322

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EXAMINER	
VERDERAME, ANNA L	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/781,999	OHKUBO, SHUICHI	
	Examiner	Art Unit	
	Anna L. Verderame	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 September 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3,4,6,8 and 9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3,4,6,8 and 9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 4 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Seo et al. JP-01-180387 in view of Bechevet et al. JP 2002-211137.

Seo et al teaches a phase change recording composition used in an information recording medium having the specific composition $(Te_{100-y}Ge_y)_{100-x}(In_zSb_{100-z})_x$ where the vales of x,y, and z are in the ranges of $2\leq x\leq 30$,$40\leq y\leq 60$, and $5\leq z\leq 60$. This composition has the atomic percentages of 28-58.8% for Te, 39.2-42% for Ge, *0.1-18% for In*, and 1.9-12% for Sb. This composition is *rich in Tellurium and Germanium*. The use of protective layer on one or both sides of the recording layer is disclosed (abstract). The abstract further recites the used of a **thin** recording film provided on a substrate (abstract). This invention results in a high C/N ratio.

Table one of Seo et al. shows the use of two separate sputtering targets GeTe and SbIn, but only one layer is formed having the composition $(Te_{100-y}Ge_y)_{100-x}(In_zSb_{100-z})_x$ where x% is (IN_zSb_{100-z}) and 100-x% is $(Te_{100-y}Ge_y)$.

However, Seo does not teach the optical recording medium structure recited in the claims.

Bechevet et al. teaches an optical disk shown in figure one, comprising two

recording composites, the second recording composite, that distant from the laser source is read through the first recording composite. The first and second access levels are mutually estranged by a spacer and the whole is put between a first transparent substrate and a second substrate. The medium is intended to be read through the transparent substrate. The first recording composite comprises a dielectric layer, a phase-change recording layer, an optical interference layer, a translucent heat dissipation layer, and other optical interference layers. The second recording composite, located distant from the laser source, is equipped with a reflecting layer applied to the spacer, a dielectric layer, a phase-change recording layer, a second dielectric and a heat sink/reflecting layer (0009-0011). The composition of the dielectric and interference layers formed on either side of the recording layers is preferably ZnS-SiO_2 , SiO_2, Si_3N_4, or GeN (0019). The phase change recording layers each have two stable states that are controlled by the laser beam (0018). Table 1 shows that the index of refraction (n) and the absorption coefficient (k) of the phase change materials differ between the crystalline and amorphous states (0023). The phase change composition chosen for this application consists of germanium, indium, antimony, and tellurium, and is chosen for its known property of improving endurance and **writing speed**(erasure rate) in optical recording media with one access level (0014). The metal alloy of specific composition, $[(Ge_yTe_{1-y})_a(Sb_zTe_{1-z})_{1-a}]_{1-b}(In_{1-x}Te_x)$ where $0.4 \leq y \leq 0.6$, $0.3 \leq z \leq 0.5$ $0.3 \leq a \leq 0.5$, $0.01 \leq b \leq 0.3$, is used as the phase change composition of the first recording composite. The thickness of the phase change layer can be as little as **6 nm** (0019). In

an example a recording layer having a thickness of **20 nm** is used (0029). Figure 6 shows that the signal to noise ratio increases with writing power(0028).

Both the translucent heat dissipation layer and the opaque heat dissipation layer are made of metallic materials and therefore are both heat-dissipative and reflective . The translucent heat dissipation is translucent as a result of its also being thing. As a result, the thin translucent heat dissipation layer fulfills the functions of being both reflective while at the same time enabling the laser to access the phase change composition of the second recording composite. The thinness of the layer results in less light being attenuated.

Bechevet et al. also makes a single layer optical recording medium, shown in drawing three, comprising a glass substrate, a dielectric layer composed of ZnS-SiO_2, a 20 nm thick phase change recording layer, a ZnS-SiO_2, and finally an aluminum reflective layer. *The composition of the phase change recording layer is an alloy of GeInSbTe that is rich in Tellurium and Germanium.* The phase-change recording layer is accessed through the glass substrate (0024-0025).

It would have been obvious to one of ordinary skill in the art to make a phase change composition within the limitations of the Seo et al. reference, where x=12, y=40, and z =10 so that the atomic percentages of each atom are 52.8%-Te, 35.2%-Ge, 1.2%-In, and 10.8%-Sb (This corresponds to the composition according to this application where x=5.94 and *y=0.20256*) this germanium and tellurium rich composition is within the range recited in the claims, and further to use this composition in the medium having

the structure taught by Bechevet et al. with the reasonable expectation of forming a useful optical recording medium based on the use of similar phase-change compositions by Bechevet et al. and in the case of the two layer media with the double recording capacity. Further, it would have been obvious to use a thin germanium and tellurium rich phase-change recording layer having a thickness of 6-13 nm based upon the direction to do so in Bechevet at (0019) and the instruction to use a thin recording layer in order to achieve a high C/N value in the abstract of Seo et al.

The composition taught in this application has atomic percentages of 30.7-38% for Ge, 52.3-53 for Te, 0-15 for Sb, and 0.3-1.4% for In.

3. Claims 1,3, 4, 6, and 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Seo et al. and Rie et al. (EP 1 172 811).

The teachings of Seo et al. can be found above. However, Seo et al. does not Teach the structure recited in the claims.

Rie et al. teaches in example 3 of this reference, the manufacture of the two layer optical recording medium shown in figure 1. The medium is comprised of a polycarbonate substrate, a first dielectric layer (45 nm), the first interface layer, the first recording layer, the second interface layer, the second dielectric layer, the first reflective layer **10nm** , the fourth interference layer, the third dielectric layer. The thickness of the first recording layer was varied in the range of **3-9 nm**. The interference layers of this embodiment were formed of GeN and the dielectric layers were formed of ZnS-SiO_2. A material represented by $(Ge\text{-}Sn)_4\ Sb_2Te_7$ was used for the first recording layer. Next, a

second substrate was prepared. On this substrate the second reflective layer 80nm, the seventh interference layer, the fifth dielectric layer, the sixth interference layer, the second recording layer (**12 nm**), the fifth interference layer (3nm) and the fourth dielectric layer (65 nm) were formed by sputtering. The material of the second recording layer was represented by the composition formula $Ge_4Sb_2Te_7$. Thereafter, the first and second information layers were attached to each other via a UV-curable resin (0014-0019). Both information-recording layers are Te and Ge rich. A linear velocity of 1 to 50 m/s is taught (0033) and (0093).

Rie et al. discusses the use of thin recording layers at (0004-0005). Thin recording layers allow for the transmittance of light in multi-layered media, and allow for a high-erasure rate (9m/s). Heat-diffusion function of the reflective layer is discussed at (0019).

It would have been obvious to one of ordinary skill in the art to make a phase change composition within the limitations of the Seo et al. reference, where x=12, y=40, and z =10 so that the atomic percentages of each atom are 52.8%-Te, 35.2%-Ge, 1.2%-In, and 10.8%-Sb (this corresponds to the composition of the present application where x=5.94 and *y=0.20256*), this germanium and tellurium rich composition is within the range recited in the claims, and further to use this composition in the medium having the structure taught by Rie et al. based on the disclosure to do so at (0071) with a reasonable expectation of forming a fully functional optical recording medium with doubled recording capacity. Further, it would have been obvious to form a thin Ge-Te rich recording film having a thickness in the range of 6-13 nm based on the example of

Rie et al. and based on the instruction to use a thin recording layer in order to achieve a high C/N value as stated in the abstract of Seo et al.

4. Claims 1,3,4,6, and 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Seo *et al.* (JP 01-180387) and further in view of Rijpers *et al.* WO 03/044786.

The teachings of Seo et al. can be found above. However, Seo et al. does not teach the structure recited in the claims.

Rijpers et al. teaches an embodiment, shown in figure one, of a multi-stack optical data storage medium for rewritable recording by means of a focused laser-light beam. The medium has a substrate 1, made of polycarbonate with deposited on a side thereof: A first recording stack comprising a phase-change type recording layer. The first recording stack is most remote for the focused laser-light beam, a second recording stack comprising a phase-change type recording layer, and a transparent spacer layer between the recording stacks. The recording layer of the first recording stack comprises the compound with atomic composition $Ge_{5.0}In_{5.5}Sb_{65.0}Te_{24.5}$ and has a thickness of 10 nm. An Ag reflective layer with a thickness of 100 nm is present in the first recording stack at a side of the recording layer of the first recording stack most remote from the other recording stack. A dielectric layer comprised of $(ZnS)_{80}(SiO_2)_{20}$ is present between the recording layer and the metal reflective layer. A heat sink layer made of $HfN_{1.2}$ is present in the first recording stack at the side closest to the second recording stack. The thickness of the heat sink layer is preferably 5-200 nm (6/30). The recording layer of the second recording stack comprises a compound with atomic composition

$Ge_{5.0}In_{5.5}Sb_{65.0}Te_{24.5}$ and has a thickness of 6nm. A heat sink layer made of $HfN_{1.2}$ having a thickness of 80 nm is present in the second recording stack at the side closest to the first recoding stack adjacent to the transparent spacer layer. A further heat sink layer mad of $HfN_{1.2}$ having a thickness of 100nm is present in the second recording stack at the side of the recording layer of the second recording stack opposite from the side of the other heat sink layer. Two dielectric layer are present both having a thickness of 20nm and made of the compound $(ZnS)_{80}(SiO_2)_{20}$ are present in contact with the recording layer of the second recording stack. Last a protective layer made of a laser-light transparent UV curable resin is present adjacent to the further heat sink layer. The protective layer may also be a sheet of polycarbonate that would not be laser-light transparent (10/10-11/10). The substrate may be opaque when the laser-light beam enters the stack via the side opposite from the side of the substrate (8/33-34).

It would have been obvious to one of ordinary skill in the art to make a phase change composition, within the limitations of the Seo *et al.* reference, where x=12, y=40 and z= 10 so that the atomic percentages of each atom are 52.8%-Te, 35.2%-Ge, 1.2%-In, and 10.8%-Sb, this composition also meets the ranges recited in this application, and to use the composition above in the recording layer of the first and second recording stack of the optical recording medium disclosed in the Rijipers *et al.* based on the disclosure to do so at (10/21) and (10/30) with a reasonable expectation of forming a fully functional optical recording medium with doubled recording capacity.

5. Claims 4 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Seo *et al.* (JP 01-180387) and further in view of Ogawa *et al.* 6,335,069.

The teachings of Seo et al. can be found above. However, Seo et al. does not teach the structure recited in the claims.

Ogawa *et al.* teaches the manufacture of a phase change optical disk comprising a substrate, a reflection layer, a first dielectric layer, a recording layer, a second dielectric layer, a second reflective layer, a UV resin coated on the second reflective layer. First, on a polycarbonate substrate having grooves for a laser beam were deposited a light absorption layer made of Au to a film thickness of 10 nm, a first dielectric layer comprising a mixture of ZnS and SiO_2 to a film thickness of 110nm, a recording layer comprising Ge, Te, and Sb to a film thickness of 11nm, a second dielectric film comprising the same material as the first dielectric layer to a film thickness of 37 nm, and a reflection layer comprising AlTi (Ti 2% atomic) to a film thickness of 70nm. Finally, a UV-curable resin was coated on the reflection layer and cured. The recording layer of the thus obtained optical disk was in an amorphous state and the disk had a reflectivity at a wavelength of 680 nm of 16.9%. Further, in the case where the recording layer of the optical disk was in the crystalline state, the reflectivity was 4.3% (9/10-40). It is further disclosed that as the material for the recording layer Ge-Te-Sb series alloys and Ge-Te-Sb-Bi series alloys are used preferably. Further, the alloys above may be incorporated with a series of elements which includes In (8/12-18).

The examiner holds that the first gold layer is transparent to the laser

Beam because it has a thickness of only 10 nm and that the AlTi layer is fully reflective because it has a thickness of 70 nm.

It would have been obvious to one of ordinary skill in the art to make a phase change composition, within the limitations of the Seo *et al.* reference, where x=12, y=40 and z= 10 so that the atomic percentages of each atom are 52.8%-Te, 35.2%-Ge, 1.2%-In, and 10.8%-Sb, and to use the composition above in the recording layer of the optical recording medium disclosed in the Ogawa *et al.* based on the disclosure to do so at (8/12-18) with a reasonable expectation of forming a fully functional optical recording medium based on the use of similar compositions for the recording layer as taught by Ogawa et al. at (8/12-18).

Conclusion

Response to Arguments

6. The applicant's amendment to claims 1,4,6, and 9 are met by the compositions of Seo et al. presented above and presented in the previous office action mailed on 05/01/2007.

In the response filed on 09/06/2007, applicant refers to disclosure in Seo et al. which discloses the use of a thin recording film having a thickness of 100nm. The examiner admits that the teaching of 100 nm is not within the applicant's disclosed range of 6-13 nm. However, Bechevet teaches the use of a tellurium and germanium rich recording layer, similar to that disclosed in Seo et al. and in the instant application, wherein the thickness is disclosed to be at least 6 nm and is 20 nm in an embodiment. The examiner is relying on the similarity in composition as a basis for the argument that

it would be obvious to form the tellurium and germanium rich recording layers of Seo et al. and the instant application to a thickness of at least 6 nm as disclosed for the tellurium and germanium rich recording layer compositions of Bechevet et al.

The examiner holds that the use of a high writing power is dependent on the mediums cooling capabilities. Further, the examiner holds that the use of heat dissipation layers along with the formation of a recording layer having a thickness of at least **6 nm(6 or more)** and a thickness of 20 nm as given in an example, increases the cooling capabilities of the medium.

As shown in the rejection the composition is rendered obvious by Seo et al and while not exemplified there is a reasonable expectation of forming a useful recording layer with the composition rendered obvious by the suggested ranges. Further, the decreased thickness of the recording layer would allow heat to be dissipated more easily and the increased ability to cool the medium would allow high powers and hence more rapid accessing of the medium(at a higher rotational rate) thus reducing the exposure time (exposure is t times intensity).

As shown in the rejection the composition is rendered obvious by Seo et al and while not exemplified there is a reasonable expectation of forming a useful recording layer with the composition rendered obvious by the suggested ranges. Further, the decreased thickness of the recording layer would allow heat to be dissipated more easily and the increased ability to cool the medium would allow high powers and hence more rapid accessing of the medium(at a higher rotational rate) thus reducing the

exposure time (exposure is t times intensity). In the response filed on 09/06/2007, applicant refers to disclosure in Seo et al. which discloses the use of a thin recording film having a thickness of 100nm. The examiner admits that the teaching of 100 nm is not within the applicant's disclosed range of 6-13 nm. However, Bechevet teaches the use of a tellurium and germanium rich recording layer, similar to that disclosed in Seo et al. and in the instant application, wherein the thickness is disclosed to be at least 6 nm and is 20 nm in an embodiment. The examiner is relying on the similarity in composition as a basis for the argument that it would be obvious to form the tellurium and germanium rich recording layers of Seo et al. and the instant application to a thickness of at least 6 nm as disclosed for the tellurium and germanium rich recording layer compositions of Bechevet et al.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anna L. Verderame whose telephone number is (571)272-6420. The examiner can normally be reached on M-F 8A-4:30P.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on (571)272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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